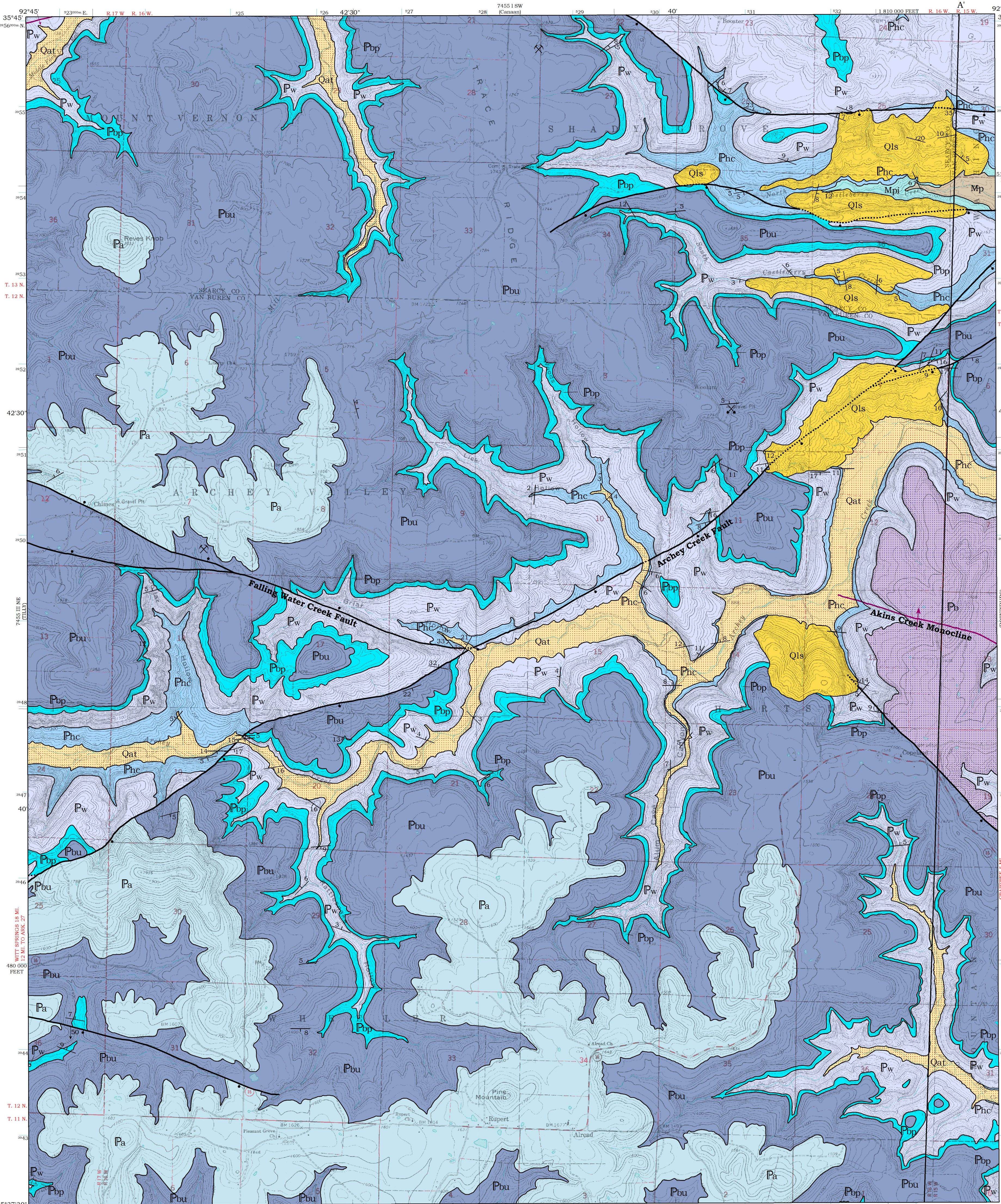


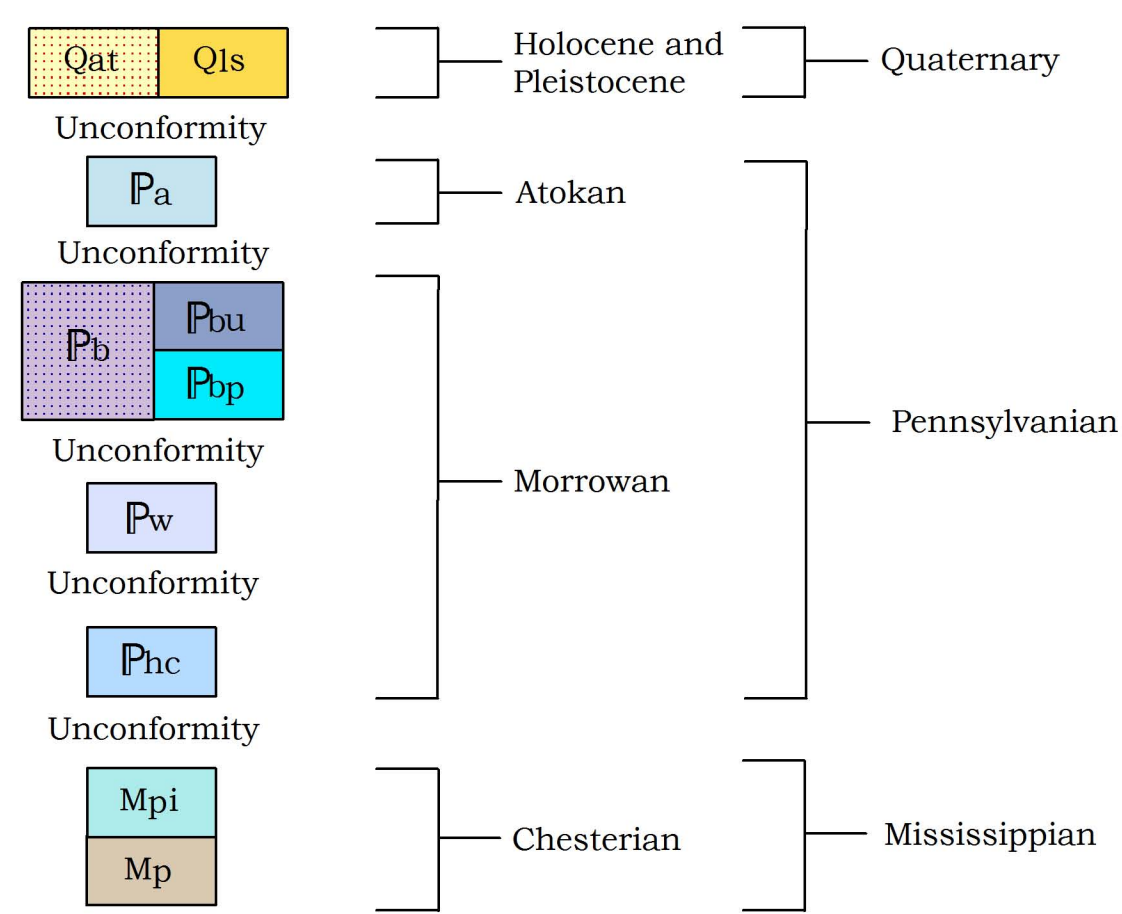


Geologic Map of the Alread Quadrangle Van Buren and Searcy Counties, Arkansas

Geology by Richard S. Hutto and Daniel S. Rains
Digital Compilation by Daniel P. Holland
2010



Correlation of Map Units



Introduction

This map graphically summarizes the bedrock geology of the Alread 7.5-minute quadrangle. In this area over 1250 feet (381 meters) of late Mississippian to middle Pennsylvanian clastic and carbonate sedimentary rocks are exposed. Regional geology of the area is controlled by an uplift centered on southeastern Missouri known as the Ozark Dome. Progressively younger rocks form a series of plateau surfaces from that area southward into Arkansas. The area of this map is located within the southernmost and highest of these plateaus—the Boston Mountains Plateau.

There are three major structural features in the mapping area. The Falling Water Creek Fault starts on the eastern edge of the Sand Gap quadrangle and continues eastward across the Smyrna and Tilly quadrangles, finally terminating against the Archey Creek Fault. This fault is part of an intermittent graben system that runs along the Falling Water Creek Fault. The Archey Creek Fault starts on the Tilly quadrangle and extends northeast along the width of this quadrangle and across at least two more to the east. It is a normal fault down-dropped to the south with up to 500 feet (152 meters) of offset. The Akins Creek Monocline starts in the east-central portion of the quadrangle and extends southeast onto the next one. This monocline brings the elevation of the rock units that cross it down to the north by approximately 100 feet (30 meters). Archey Creek is the only major drainage on the map aside from a small portion of the Middle Fork of the Little Red River. Archey Creek flows into the South Fork of the Little Red River southeast of this area near Clinton, Arkansas.

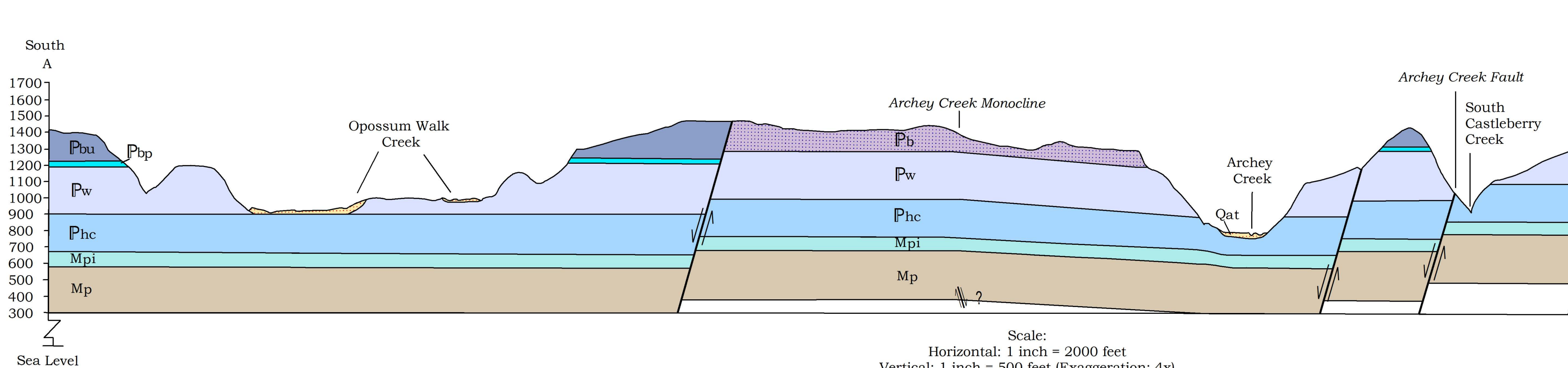
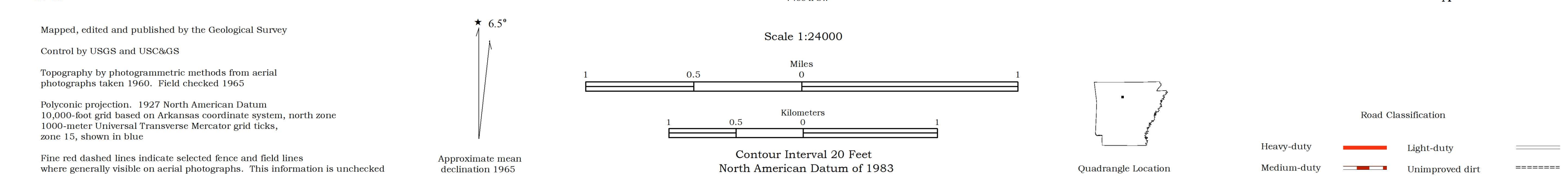
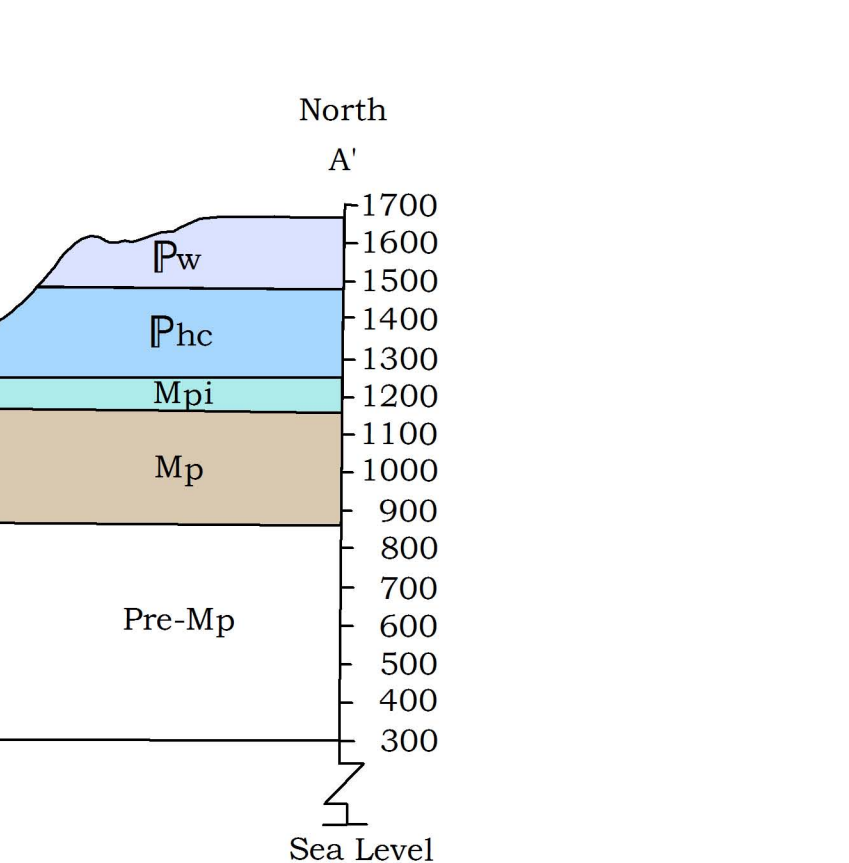
The geology of the Alread quadrangle was mapped circa 1973 by Boyd R. Haley for the 1:500,000 scale Geologic Map of Arkansas. The current mapping builds on the previous work, but uses a revised stratigraphy and depicts structures and rock units in more detail. The contacts and structural features on this map were derived from field observations made from July 2009 through April 2010. Site locations were generated with the aid of a global positioning satellite receiver. Bedrock dipping at less than 2° was considered horizontal.

Description of Map Units

- Qat** Alluvium and terrace deposits (Quaternary) – composed of unconsolidated clay, silt, sand and gravel deposited by major streams, including deposits on one or more terrace levels.
- Qls** Landslide deposits (Quaternary) – unsorted, unconsolidated rock and debris material typically resulting from failure of oversteepened slopes of interbedded sandstone and shale units.
- Pa** Atoka Formation (Pennsylvanian, Atokan) – sequence of black to tan shale interbedded with very thin- to thin-, ripple-bedded, micaceous siltstone and thin- to very thick-bedded, or massive sandstone. Sandstone is typically quartz arenite with very fine to fine, sub-angular to sub-rounded grains. Color is tan to orange on fresh surfaces, and weathers dark orange to brown. Locally exhibits cross-bedding, striae, and shale-pebble or chert-pebble conglomeratic zones. Unconformable with the underlying Blount Formation. Approximately 440 feet (134 meters) of the lower Atoka is exposed.

Symbols

- Contact
- Normal fault - dotted where concealed
- Indicates down-dropped block
- Indicates dip of fault plane
- Monocline
- Strike and Dip
- Mine or quarry
- Gravel pit



Blount Formation (Lower Pennsylvanian, Morrowan) – informally divided into upper and lower parts on adjacent quadrangles separated by the Middle Blount sandstone (Braden and Ausbrooks, 2003). The term “Parthenon sandstone” has replaced the term “Middle Blount sandstone” (Zachry and Haley, 1973) due to recent work by Chandler and Zachry (2010). On this map, the Parthenon sandstone separates the upper part of the Blount from the Wits Springs Formation. In areas on the east side where the Parthenon is no longer distinguishable, the Blount is undifferentiated.

Blount Formation (undifferentiated) – consists of fissile clay shale interbedded with thin- to very thick-bedded or massive, very fine- to coarse-grained micaceous sandstone with lesser amounts of siltstone, sandy limestone and limy sandstone. Shale is tan to black on fresh surfaces and weathers orange to brown. Sandstone is orange to brown, buff to tan and pink on fresh surfaces, and weathers light to dark brown. It is typically well-sorted, though sandstone, shale and chert-pebble conglomeratic zones crop out locally. Commonly exhibits siliceous case-hardening and well-developed cross- and channel-bedding. Siltstone is typically very thin- to medium-bedded, light- to medium-gray on fresh surfaces, and weathers tan to brown. It is typically well-indurated, with shale partings along micro cross-laminations. Sandy limestone and limy sandstone units are typically thin- to medium-bedded, medium- to dark-gray on fresh surfaces and weathers dark-brown. They are finely to coarsely crystalline and locally fossiliferous. Fossils include brachiopods, gastropods, bryozoans and nautiloids. The Blount is unconformable with the underlying Wits Springs sandstone. Up to approximately 260 feet (79 meters) is exposed.

Upper part – fissile clay shale interbedded with thin- to medium-, massive-bedded fine- to medium-grained, micaceous sandstone and siltstone. Sandstone is buff to tan or red on fresh surfaces, and weathers orange and frable. Commonly exhibits ripple-marks and cross- to channel-bedding. Locally displays discontinuous, fossiliferous sandy limestone beds, conglomeratic zones, shale-partings, lenticular banding and coal stringers. The upper part is conformable with the Parthenon sandstone below. Thickness ranges from approximately 200 to 320 feet (61 to 98 meters).

Parthenon sandstone – medium- to very thick-, massive-bedded, very fine- to medium-grained sandstone with minor shale interbeds. Sandstone is white to tan on fresh surfaces, and weathers orange to brown. It is typically a well-indurated litharenite that is locally cross- to channel-bedded, striae, micaceous and siliceous. Locally contains fossils or fossil molds and shales or quartz-pebble conglomerate. The Parthenon is unconformable with the Wits Springs Formation below. Thickness ranges from approximately 40 to 80 feet (12 to 24 meters).

Wits Springs Formation (Lower Pennsylvanian, Morrowan) – equivalent to the Lower part of the Blount Formation below the Parthenon sandstone (Braden and Ausbrooks, 2003; Chandler and Zachry, 2010) and the Prairie Grove Member of the Hale Formation. Composed of a variable sequence of interbedded sandstone and shale units with intermittent units of calcareous sandstone and limestone. A typical sequence contains 2 or more massive sandstone units ranging from 20 to 80 feet (6 to 24 meters) thick that locally form prominent bluffs which are separated by black clay silt and very thin- to thin-, ripple-bedded, very fine- to fine-grained sandstone units. Massive sandstone is quartz arenite to litharenite, typically well-sorted, fine- to medium-grained and rounded to sub-rounded. Color is buff to gray or tan with brown iron-oxide blebs on fresh surfaces. Weathers orange or orange-brown to dark brown and puffy. Liesegang banding is common. Intervals of sandstone, shale and quartz-pebble conglomerate are common. Discontinuous, typically cross-bedded limy sandstone and sandy limestone units form ledges interbedded with shale in the upper third. They consist of fine sand and finely to coarsely crystalline calcite and are locally fossiliferous, oolitic and conglomeratic. Crinoid fragments are common, but other fossils include rugose corals, fenestrate bryozoans and brachiopods. Unconformable with the Cane Hill Member below and in some places has obviously scoured into it. Total thickness ranges from approximately 220 to 450 feet (67 to 146 meters).

Hale Formation (Lower Pennsylvanian, Morrowan) – consists of two members: the Prairie Grove and the Cane Hill. Only the Cane Hill Member is mapped on this quadrangle. Rocks equivalent to the Prairie Grove Member are mapped as a part of the Wits Springs Formation.

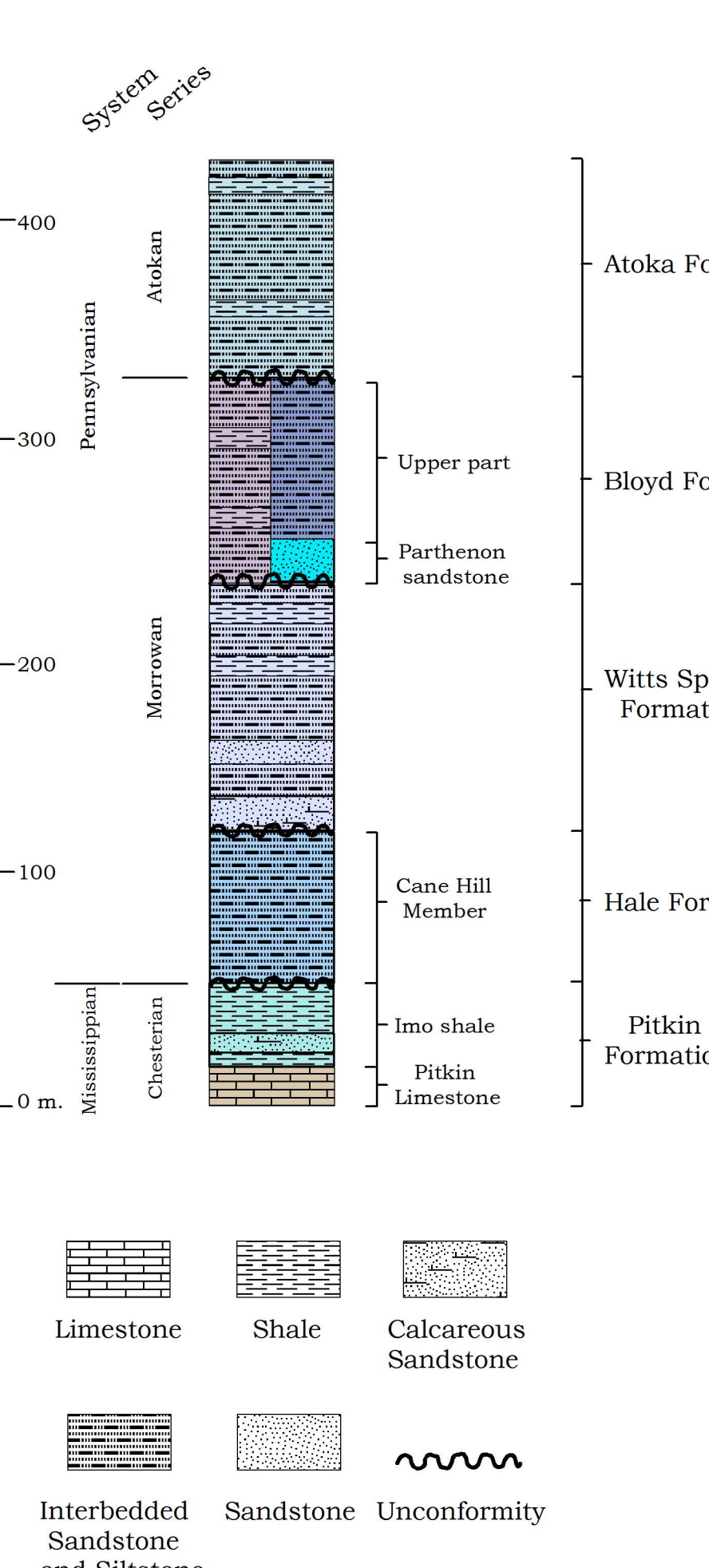
Cane Hill Member typically medium- to dark-gray, thin-, ripple- to cross-bedded sandstone interbedded with black clay to silty shale and siltstone. Medium- to thick-bedded or massive siltstone crops out locally. Thin-bedded sandstone is a litharenite composed of mostly subangular, glassy to opaque quartz grains that are very fine to fine and moderately well-sorted. Cement is typically siliceous, however is locally calcareous. Fossil fragments can be associated with these calcareous zones. Trace fossils and load casts are present above shaly units. Unconformable with the underlying lino shale. Thickness ranges from approximately 220 to 280 feet (67 to 85 meters).

Pitkin Formation (Upper Mississippian, Chesterian) – informally divided into two members, the Pitkin Limestone and the lino shale. Lower contact of the lino placed at the top of the final limestone bed in the Pitkin, and upper contact placed below the base of a competent, very thin- to thin-, ripple-bedded, silty sandstone that is the first recognizable unit in the Cane Hill Member (Smith and Hutto, 2007). The Pitkin is only exposed in a small area in North Castleberry Creek.

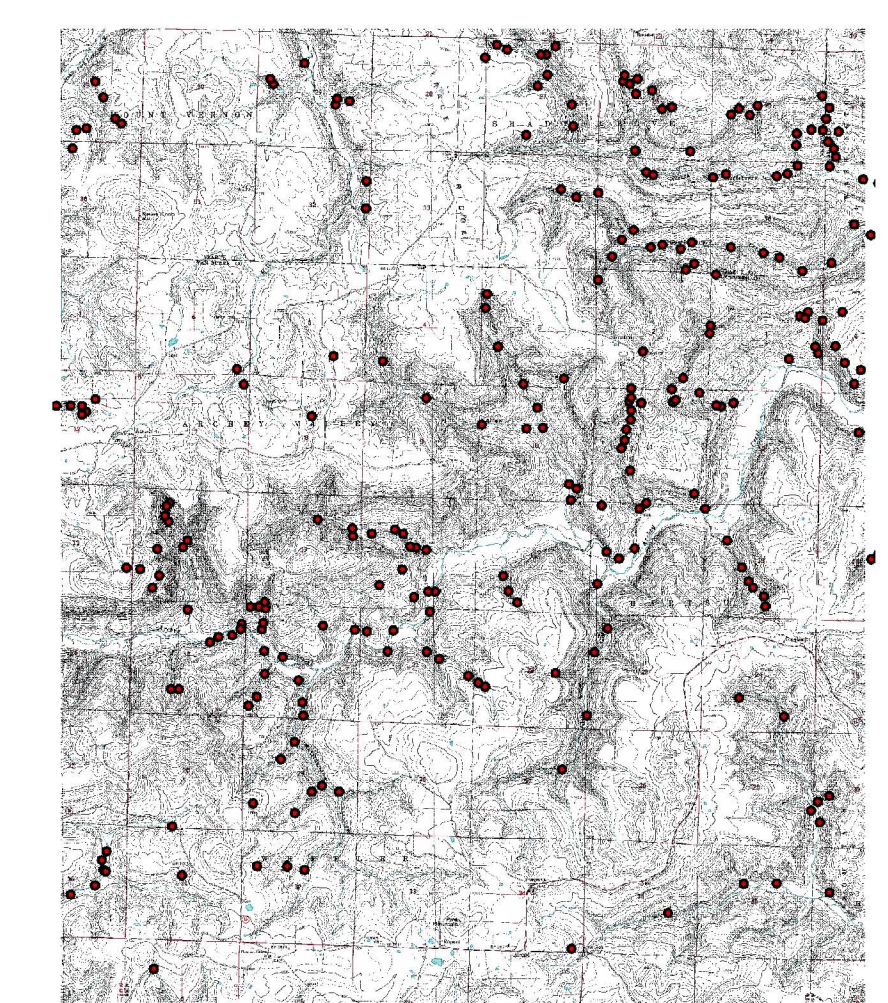
lino shale (Upper Mississippian, Chesterian) – thin- to thick-bedded ledges of sandstone interbedded with black silty shale. The shales locally contain lenticular ironstone concretions. The sandstone is very fine-grained, light- to dark-gray on fresh surfaces, and weathers red to brown. Moderately calcareous, silty, coaly and contains sparse fossil and rock fragments. Conformable with the underlying Pitkin Limestone. Ranges from approximately 80 to 100 feet (24 to 30 meters).

Pitkin Limestone (Upper Mississippian, Chesterian) – consists of interbedded black clay shale and medium- to dark-gray, coarse-grained, oolitic, biohermal limestone. Fossils include crinoids, brachiopods and bryozoans. Limestone typically has petrifoliar odor when freshly broken. Approximately 60 to 80 feet (18 to 24 meters) of the upper Pitkin is exposed.

Stratigraphic Column



Joints and cross-bedding in friable Wits Springs sandstone south of Archey Creek.



Topographic map of the Alread quadrangle. Red dots indicate location of data collection points.

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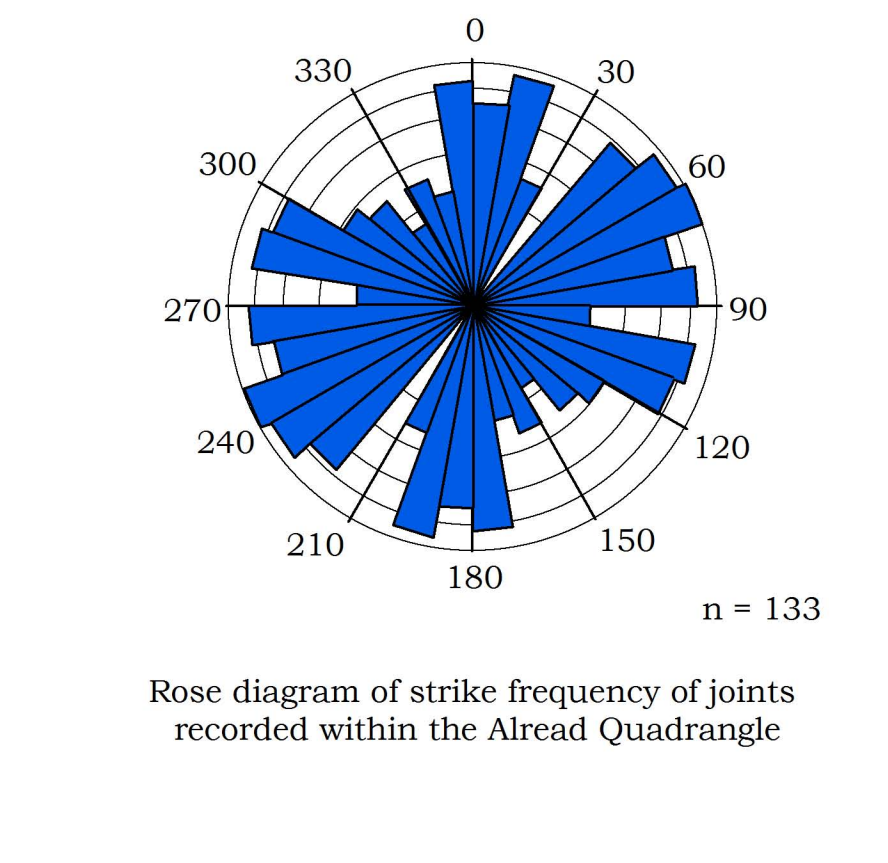
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Joint Frequency



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